

## AN INSET MECHANISM FOR ELECTRONIC ASSEMBLIES

## BACKGROUND OF THE INVENTION

## 1. Field of the Invention

[0001] The invention relates generally to a method and an apparatus for maintaining and  
5 releasing an interconnection between an electronic device and mechanical assembly to which it  
attaches. More specifically the invention applies to an electronic device for driving illumination  
means within a liquid crystal display or LCD panel.

## 2. Description of Related Art

[0002] As the demand for smaller, more powerful electronic systems increase, system  
10 manufacturers require better methods of efficient assembly while decreasing the size of the  
electronic components within the electronic system. An areas which has cause printed circuit  
board (PCB) designers problems concerns ways of mounting and servicing LCD assemblies.

[0003] There are but a few ways of mounting electronic components such as LCD  
modules and inverters to such assemblies as liquid crystal displays. For example, inverters can  
15 be joined to frames using adhesives. In other instances, the devices are joined to frames fixed by  
a self taping screw or a screw and associated nut. The options in mounting are even fewer when  
the modules must be removable for accomplishing the initial assembly operations and thereafter  
repair operations.

[0004] Existing methods, designs and materials exhibit poor long term reliability and the  
20 later because it utilizes fastening hardware, such as screws, consume excessive package volume.  
Either solution typically results in higher assembly costs. In many instances the time expended in  
module removal does not justify the repair and the item is scrapped. The electronics industry,  
notably the LCD industry would benefit from a method of assembly and disassembly that would  
be quick and reliable and also allow for the reuse of the major portion of the electronic device.

## SUMMARY OF THE INVENTION

[0005] Electronic components, such as semiconductors and LCD devices are rigidly maintained in a mechanical assembly through an interconnection formed by a tongue-and-groove securing structure.

5 [0006] A holder with electronic components mounted thereon is formed from a tongue-and-groove mounting device, which couples into a bisected frame section having two opposing grooves in a horizontal direction. The holder is comprised of two opposing tongues, a first upper tongue portion and a second lower tongue portion, the total length of which, is less than an opening provided by the total length of the two opposing grooves in a horizontal direction.

10 [0007] The invention herein also comprises a method of assembly whereby interfitting a tongue having a lower tongue and an upper tongue, upon which is mounted an electronic device, into a grooved frame having a lower side and an upper side, such that sliding the lower tongue into a groove frame on a lower side situates the tongue and subsequent sliding of the tongue in the direction of the groove frame on the upper side, causes the groove to receive the upper  
15 tongue, thereby locking the tongue into the assembly.

[0008] The electronic component module generally requires considerable assembly time and thereafter requires a high degree of mechanical integrity when connected. Therefore, it is an object of the present invention to provide an inset mechanism for an electronic device such as an inverter or LCD module that is focused on saving assembly cost and on providing a high level of  
20 mechanical durability.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The invention is best understood from the following detailed description when read in connection with the accompanying drawing. The various features of the drawings are not exhaustively specified. On the contrary, the various features may arbitrarily be expanded or  
25 reduced for clarity. Included in the drawing are the following figures:

[0010] FIG. 1a is a plan view of the invention illustrating the insertion position of the electronic module.

[0011] FIG. 1b is a plan view of the invention illustrating the first position of the insertion of the electronic module.

[0012] FIG. 1c is a plan view of the invention illustrating the final position of the insertion of the electronic module.

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#### DETAILED DESCRIPTION OF THE INVENTION

[0013] Electronic components, such as semiconductors and LCD devices are rigidly maintained in a mechanical assembly through an interconnection formed by a tongue-and-groove securing structure.

10 [0014] A holder with electronic components mounted thereon is formed from a tongue-and-groove mounting device, which couples into a bisected frame section having two opposing grooves in a horizontal direction. The holder is comprised of two opposing tongues, a first upper tongue portion and a second lower tongue portion, the total length of which, is less than an opening provided by the total length of the two opposing grooves.

15 [0015] As shown on FIG. 1a, FIG. 1b and FIG. 1c, a tongue-and-groove assembly 100 couples an electronic module 105 and a holder 180 into a bisected grooved frame 160 composed of two sections 170a and 170b. As shown on FIG. 1a, the bisected groove frame sections 170a and 170b include, an upper groove portion 130 and a lower groove portion 190.

20 [0016] The total length of the holder 180 containing the upper tongue portion 114 and a lower tongue portion 116, is less than the opening provided by the total length of the groove portion 130 and 190 extended in a horizontal direction.

[0017] The electronic module 105 may be, by way of example, a semiconductor device or LCD, which is mounted on the holder 180 and typically bonded by a bonding material 150, such as a suitable adhesive.

25 [0018] The assembly 100 comprises: the frame 160 configured with the grooved frame members 170a and 170b, wherein the member 170b forms the upper side, which in FIG.1a is to the right side, and wherein the member 170a forms the lower side, which in FIG.1a is to the left side of the grooved frame respectively; and a holder having a lower tongue 116 fit into a lower

channel such as a groove 190 and an upper tongue 114 fit into a upper channel or groove 130, respectively. The upper tongue 114 top surface 122 has mounted thereon an electronic device 105. The lower tongue 116 is inserted into the lower groove 190 of the frame, 160 on the lower side 170a and the opposing upper tongue 114 is brought into contact with the right side of the frame 160 on the upper side 170b, top surface 140. Thereafter holder 180 is slid in a rightward horizontal direction into the lower groove 130 thereby interfitting the tongues 116 and 114 respectively into the frame members 170a and 170b respectively.

[0019] The assembly of the holder 180 into the groove frame sections 170a and 170b requires that the holder 180 edge 118, of the lower tongue portion 116 be inserted into the lower groove 190 and set onto the lower groove surface 140. In a next step as shown in FIG. 1b, the holder 180 lower tongue 116 is inserted into the lower groove position abutting a vertical wall 175. This situates the tongue at one end such that in a final step shown in FIG. 1c the holder 180 is then slide into the direction of the groove connector portion 170b, until the electronic module 105 abuts a vertical wall 115.

[0020] Additionally, the holder 180 lower tongue portion 116 has a top surface 125 which fits securely into the lower grove 190. The lower tongue top surface 125 is in the same plane as the lower groove surface 140. Once the device 105 abuts the wall or in a proximate position within 0.5 mm to 1.0 mm, the device 105 is essentially locked into place.

[0021] In a reversible operation, the holder 180 as inserted may be removed by sliding the holder 180 in the direction of the groove 170a towards the wall 175. When a space 110 discloses the edge of the upper tongue 114 then the holder 105 can be releasably detached from the bisected groove frame 170a-170b.

[0022] As indicated the assembly of the holder 180 into the groove frame sections 170a and 170b requires that the holder 180 edge 118, of the lower tongue portion 116 be inserted into the lower grove 190 and set onto the lower groove surface 140. However, the lower tongue portion 116 and corresponding edge 118 may be substantially rectangular in cross section or alternatively beveled or in a conical section for ease of insertion. Likewise the upper tongue portion 135 and its edge may be substantially rectangular in cross section or alternatively beveled or in a conical section for ease of insertion. To further assist in the ease of insertion, the vertical

wall 115 may be substantially rectangular in cross section or alternatively beveled or in a conic section for ease of insertion.

[0023] The invention herein also comprises a method of assembly whereby interfitting the holder 180 having a lower tongue 116 and an upper tongue 114, upon which is mounted the electronic device 105, into the grooved frame 160 such that sliding the lower tongue 116 into a groove frame 160 on a lower side situates the tongue 116 and subsequent sliding of the tongue 114 in the direction of the groove frame 160 on the upper side 170b, causes the groove 160 to receive the upper tongue 114, thereby locking the holder into the assembly.

[0024] More particularly the method of assembly comprises the steps of: mounting the device 105 onto the surface 122; interfitting the surface 122, having the lower tongue 116 and the upper tongue 114, into the grooved frame 160 composed of two sections 170a and 170b, having a lower side and an upper side, sliding the lower tongue 114 into the groove frame 160 section 170a on the lower side, situating the lower tongue 116 at one end 175, and sliding the upper tongue 114 in the direction of the groove frame 160 section 170b on the upper side, so as to receive the upper tongue 114 thereby locking the surface into position.

[0025] To disengage the device, employs the steps of: sliding of the insertion means 180 in the direction of a groove frame 170a on the lower side, and lifting the insertion means 180 in a direction away from the grove frame 170a-170b, causing the device 105 to disengage from the assembly.

[0026] It is to be understood that the form of this invention as shown is merely a preferred embodiment. Various changes may be made in the function and arrangement of parts; equivalent means may be substituted for those illustrated and described; and certain features may be used independently from others without departing from the spirit and scope of the invention as defined in the following claims.